Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-46 (cancelled)

Claim 47 (currently amended) A method for modeling injection of a fluid into a mold defining a three dimensional cavity, the method comprising the steps of:

(a) providing a three dimensional computer model defining a cavity;

(b) discretizing a solution domain based on the model;

(c) specifying boundary conditions; and

(d) solving for process variables using conservation of mass, conservation of momentum, and conservation of energy equations for at least a portion of the solution domain,

wherein step (d) comprises the substep of using an explicit scheme in solving the conservation of energy equation and wherein the explicit scheme comprises a thermal clock that varies locally and may proceed differently than a global clock.

Claim 48 (previously presented) The method according to claim 47, wherein the explicit scheme is an explicit temperature convection scheme.

Claim 49 (previously presented) The method according to claim 47, wherein the explicit scheme comprises a one dimensional analytic function, data derived from a one dimensional analytic function, or a discrete function describing the temperature distribution about a node.

Claim 50 (cancelled)

Claim 51 (currently amended) The method according to claim ~~50~~47, wherein the thermal clock is a node thermal clock.

Claim 52 (currently amended) The method according to claim ~~50~~47, wherein step (d) comprises the substep of calculating a Peclet number to estimate relative contributions of convection and conduction to heat transfer at a node.

Claim 53 (previously presented) The method according to claim 47, wherein step (d) comprises determining temperature at an upstream position corresponding to a particle location at a previous time step.

Claim 54 (previously presented) The method according to claim 47, wherein step (d) comprises the substep of calculating contribution to heat transfer due to at least one of viscous dissipation, heat of compression, heat of decompression, heat of solidification, and heat of reaction.

Claim 55 (cancelled)

Claim 56 (currently amended) A method for modeling injection of a fluid into a mold defining a three dimensional cavity, the method comprising the steps of:

(a) providing a three dimensional computer model defining the cavity;

(b) discretizing a solution domain based on the model;

(c) specifying boundary conditions; and

(d) solving for process variables using conservation of mass, conservation of momentum, and conservation of energy equations for at least a portion of the solution domain, wherein:

step (b) comprises the substep of generating a finite element mesh based on the model by subdividing the model into a plurality of connected elements defined by a plurality of nodes; ~~and~~

step (d) comprises the substep of determining a location of a solid/liquid interface, the determination of the interface comprising the substep of determining locations at which a process variable achieves a given value; and

step (d) further comprises the substep of removing from the solution domain nodes corresponding to elements which contain no unfrozen material.

Claim 57 (previously presented) The method according to claim 56, wherein the process variable of step (d) which is used to determine a location of a solid/liquid interface is one of the group consisting of temperature, velocity, and a process variable combining temperature and velocity.

Claim 58 (previously presented) The method according to claim 56, wherein step (d) further comprises the substep of determining an effective viscosity for each of a plurality of elements containing the solid/liquid interface by calculating a volume fraction of freeze within the element.

Claim 59 (previously presented) The method according to claim 56, wherein step (d) further comprises the substep of determining an effective pressure at a position in the solution domain by identifying core nodes within the solution domain.

Claim 60 (cancelled)

Claim 61 (previously presented) The method according to claim 56, wherein step (d) further comprises the substep of projecting a core pressure onto an outer cavity frozen layer.

Claim 62 (currently amended) A molded plastic component formed from a process developed using the method of at least one of claims ~~1, 6,~~ 47~~, 55,~~ and 56.

Claim 63 (previously presented) The method according to claim 56, wherein step (d) further comprises the substep of describing linear variation of a process variable throughout each of a plurality of elements.

Claim 64 (previously presented) The method according to claim 56, wherein step (d) further comprises the substep of using a one dimensional analytic function to describe variation of a process variable about a point.

Claim 65 (currently amended) An apparatus for modeling injection of a fluid into a mold defining a three dimensional cavity, the apparatus comprising:

a memory for storing code that defines a set of instructions; and

a processor for executing said set of instructions to:

(a) discretize a solution domain based on a three dimensional computer model defining a cavity; and

(b) solve for process variables using conservation of mass, conservation of momentum, and conservation of energy equations, wherein an explicit scheme is used to solve the conservation of energy equation and wherein the explicit scheme comprises a thermal clock that varies locally and may proceed differently than a global clock.

Claim 66 (previously presented) The apparatus of claim 65, wherein the explicit scheme is an explicit temperature convection scheme.

Claim 67 (cancelled)

Claim 68 (new) The method according to claim 47, wherein step (d) comprises solving for fluidity over at least part of the solution domain.

Claim 69 (new) The method according to claim 47, wherein step (d) comprises using a formulation derived from the conservation of mass and conservation of momentum equations.

Claim 70 (new) The method according to claim 47, wherein step (d) comprises using at least one of a Nakano formulation, a Stokes formulation, and a Navier-Stokes formulation to solve for fluidity over at least part of the solution domain.

Claim 71 (new) The method according to claim 56, wherein step (d) comprises solving for fluidity over at least part of the solution domain.

Claim 72 (new) The method according to claim 56, wherein step (d) comprises using a formulation derived from the conservation of mass and conservation of momentum equations.

Claim 73 (new) The method according to claim 56, wherein step (d) comprises using at least one of a Nakano formulation, a Stokes formulation, and a Navier-Stokes formulation to solve for fluidity over at least part of the solution domain.

Claim 74 (new) An apparatus for modeling injection of a fluid into a mold defining a three dimensional cavity, the apparatus comprising:

a memory for storing code that defines a set of instructions; and

a processor for executing said set of instructions to:

(a) discretize a solution domain based on a three dimensional computer model defining a cavity;

(b) generate a finite element mesh based on the model by subdividing the model into a plurality of connected elements defined by a plurality of nodes;

(c) determine a location of a solid/liquid interface by determining locations at which a process variable achieves a given value; and

(d) remove from the solution domain nodes corresponding to elements which contain no unfrozen material.